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A COMPREHENSIVE PROGRAM FOR WATER POLLUTION CONTROL FOR THE RED RIVER OF THE NORTH BASIN DEVELOPED BY THE STATE WATER POLLUTION CONTROL AGENCIES OF MINNESOTA, NORTH DAKOTA, AND SOUTH DAKOTA ADOPTED BY U.S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE, PUBLIC HEALTH SERVICE, WATER POLLUTION SERIES REPORT

Public Health Service
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1953

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Water Pollution Series, No. 53

A COMPREHENSIVE PROGRAM FOR WATER POLLUTION CONTROL

for the

Red River of the North Basin

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Water pollution series

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A COMPREHENSIVE WATER POLLUTION CONTROL PROGRAM

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Red River of the North Basin

Developed by the State Water Pollution Control Agencies
of Minnesota, North Dakota, and South Dakota

1953

Adopted by

U. S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
Public Health Service

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Public Health Service Publication No. 293

WASHINGTON: 1953

FOREWORD

Our country's development over the past 50 years has been marked by tremendous progress in many fields. It has made possible great gains in the health, comfort, and well-being of the people. But it has not been without cost. Part of the cost has been the damage to the Nation's water resources that has resulted from wastes discharged to the streams by our growing cities and industries. All water uses have been affected--public water supplies, recreation, agriculture, industry, fish and aquatic life.

In enacting the Federal Water Pollution Control Act in 1948, the Congress declared that "water pollution has become a matter of grave concern in many areas and its damaging effects on the public health and national resources are a matter of definite Federal concern as a menace to national welfare. Abatement must be undertaken in order to control it."

The Public Health Service, as part of its responsibilities under this Act, is required to prepare or adopt, in cooperation with other Federal agencies, State and interstate water pollution control agencies, and municipalities and industries, comprehensive programs for the abatement of pollution.

This publication summarizes the "COMPREHENSIVE WATER POLLUTION CONTROL PROGRAM FOR THE RED RIVER OF THE NORTH BASIN" of the Minnesota State Department of Health, North Dakota State Department of Health, and the South Dakota State Department of Health. The program ~~is sound and~~ gives full consideration to the several present uses and to the reasonably-anticipated future uses of the waters of this basin. It provides an equitable balance in the pollution control requirements for the various private and public groups concerned.

I am pleased, therefore, in my capacity as Surgeon General of the Public Health Service, to adopt the program developed by the State water pollution control agencies of Minnesota, North Dakota, and South Dakota for the Red River of the North Basin as a comprehensive program which fully meets the requirements of the Federal Water Pollution Control Act.

This program is based on beneficial water uses and related conditions that prevailed on January 1, 1953. Comprehensive programs for pollution control must necessarily be flexible. They must allow for growth, development, and changing conditions. Any significant changes affecting water quality, such as stream flow, water use, industrial development, population, etc., may require changes in the pollution control program.

Obviously the mere adoption of this program will not, in itself, reduce pollution or improve the usefulness of the waters in this basin. It does provide to the citizens of the area and to the city officials and industrial leaders, farmers, fishermen, conservationists, and others an objective plan based on good engineering practice, and reflecting sound economics. It is a plan which the public can support, and must support, if progress is to be made in the abatement of pollution.

Certain additional considerations beyond the mere acceptance of a plan are essential to its successful execution. The citizens of the areas affected must see that sufficient resources are provided to the State water pollution control agencies concerned to enable them to make the technical investigations necessary to aid those responsible for constructing pollution abatement works.

We must recognize, too, that in order to be fully effective the plans and programs of one State must be geared closely to those of adjoining States, since State boundaries are no barrier to pollution traveling in interstate streams. Above all, no program of this nature can progress beyond the report stage if its meaning and purpose are not made clear and understandable to the citizens of the area. In the final analysis they are the ones who will pay, directly or indirectly, for the pollution abatement works that are needed.

It is my hope that this program for the Red River of the North Basin will be carried through to completion as soon as possible so that the area may enjoy all the benefits that clean water can provide, in health and recreational opportunities for the people and in sound growth of industry and agriculture.

Leonard A. Scheele

Leonard A. Scheele
Surgeon General

INTRODUCTION

The comprehensive program for the Red River of the North is based on the programs of the water pollution control agencies of the States of North Dakota, South Dakota, and Minnesota for this stream. A number of reports of State and Federal cooperative investigations of this interstate stream have been published and have considered present and anticipated future water uses, the quality of water necessary to permit these uses, sources of pollution and their effects on the receiving waters and water uses, benefits derived from abatement of pollution, the added detrimental effect of critical low flows, and finally-needed pollution abatement facilities. The reports upon which this program is based are as follows:

(1) Pollution of the Red River of the North--Report of Joint Investigation by the Minnesota State Board of Health and the North Dakota State Board of Health in collaboration with the Division of Game and Fish, Minnesota Department of Conservation (1931 - 1932 - 1933). (Area concerned--main stem from Breckenridge to International Boundary.) Reference copy on file with the Minnesota and North Dakota State Health Departments and the Upper Mississippi and Great Lakes Drainage Basins Office, U. S. Public Health Service.

(2) Red River of the North Research Investigation (1938 - 1941). (Area concerned--entire drainage basin.) Report of a joint investigation by the North Dakota State Department of Health and the Minnesota State Board of Health in collaboration with the U. S. Public Health Service prepared by the North Dakota State Department of Health. Reference copies on file with above agencies.

(3) Appendix M--Coordinated Water Plan of the Red River Survey Report (24 September 1947). (Area concerned--main stem and Ottertail, Sheyenne, and Red Lake Rivers.) Prepared by and available from St. Paul District, Corps of Engineers.

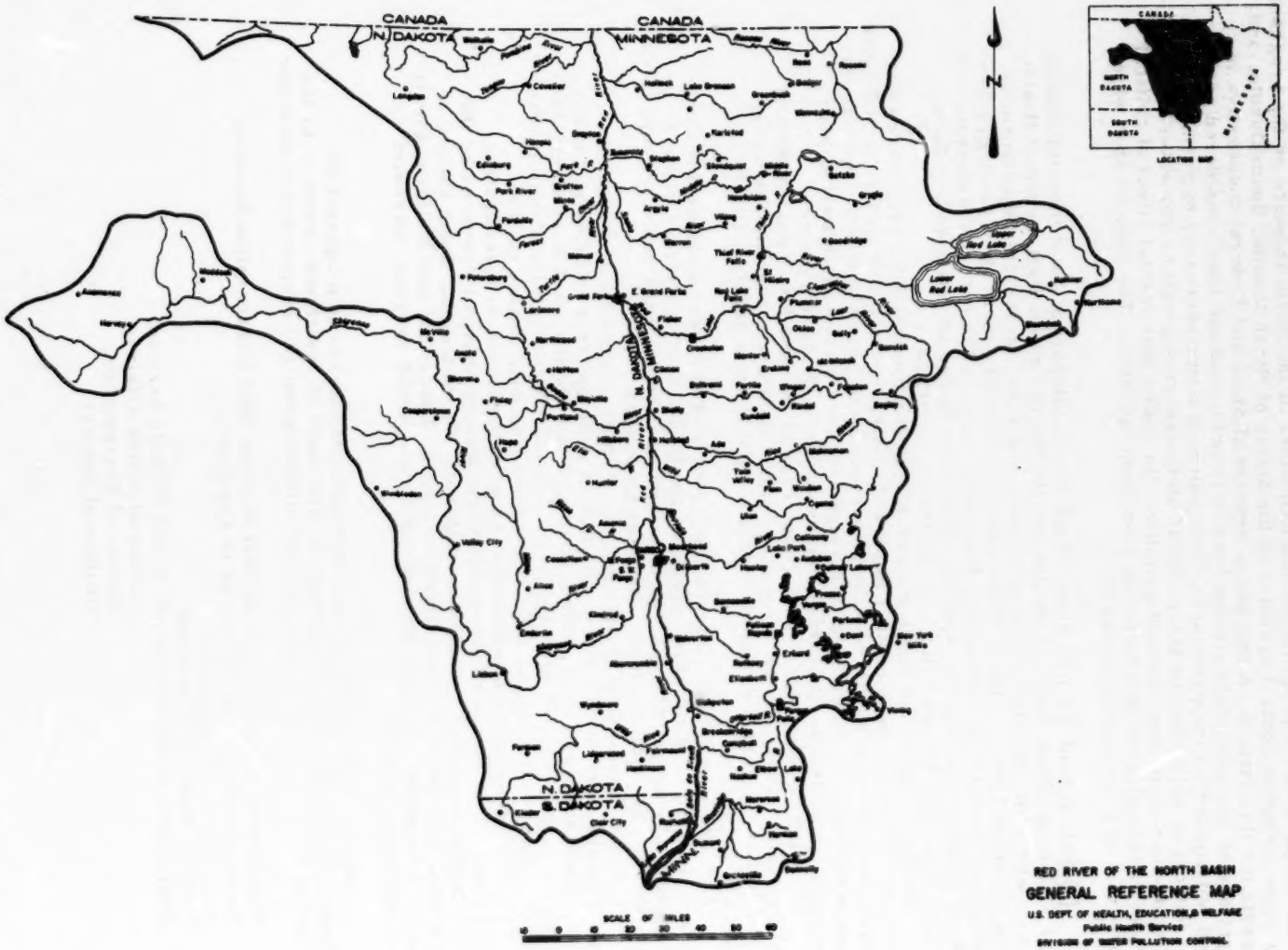
(4) Water Use Survey, International Souris-Red Rivers Engineering Committee, Red River Watershed; prepared by the St. Paul District, Corps of Engineers (January 1950). (Area concerned--entire drainage basin.) Available through St. Paul District, Corps of Engineers.

(5) Upper Mississippi Drainage Basin Report--Cooperative Report by Public Health Service and water pollution control agencies in Illinois, Indiana, Iowa, Minnesota, Missouri, North Dakota, South Dakota, and Wisconsin (1951). (Area concerned--entire drainage basin.) Available through the Public Health Service, Upper Mississippi and Great Lakes Drainage Basins Office.

(6) Missouri-Souris Development Area Water Pollution Investigation (November 1951). (Area concerned--entire drainage basin.) Prepared by the water pollution control agencies of Minnesota, North Dakota, South Dakota, Wyoming, and the U. S. Department of Health, Education, and Welfare, Public Health Service and available through the Public Health Service, Missouri Drainage Basin Office.

In addition to the cooperating State agencies, on whose programs this document is based, acknowledgment is also made of assistance rendered by the following Federal agencies who provided information and reviewed this document:

Department of Agriculture (Forest Service, Soil Conservation Service)
Department of the Army (Corps of Engineers)
Department of Commerce
Federal Power Commission
Department of the Interior (Fish and Wildlife Service,
Bureau of Indian Affairs,
Bureau of Reclamation,
Geological Survey)


CANADA
N. DAKOTA
CANADA
MINNESOTA
N
LOCATION MAP
N. DAKOTA
S. DAKOTA
SCALE OF MILES
0 10 20 30 40 50 60
RED RIVER OF THE NORTH BASIN
GENERAL REFERENCE MAP
U.S. DEPT. OF HEALTH, EDUCATION, & WELFARE
Public Health Service
DIVISION OF WATER POLLUTION CONTROL

VII

GENERAL DESCRIPTION

The Red River of the North, formed by the junction of the Ottertail and Bois de Sioux at the twin cities of Wahpeton, N. D., and Breckenridge, Minn., forms the boundary between North Dakota and Minnesota as it flows northward 394 miles before reaching the International Boundary. Of 36, 260 square miles drained by the Red River at the International Boundary, 95 percent is in the United States and the remaining 1, 995 square miles are in the Dominion of Canada. The climate is temperate with temperatures ranging from 95°F. in the summer to -35°F. in the winter, and the mean annual precipitation is about 20 inches.

Stream flows in the Red River of the North and its tributaries vary widely. In some of the Minnesota tributaries the flow is fairly constant, while in other parts of the basin the tributaries frequently have high spring runoffs which often cause damaging floods but later their flows are very low, sometimes even approaching zero. This wide variation has a serious effect on the amount and quality of water available for various purposes and in this way has a definite bearing on the type of water uses which are satisfactory under such conditions. The shortage of water, either from surface or ground sources, has restricted development of the industrial potential of parts of this basin and the main stem. The need to conserve stream flows for municipal and industrial water supplies has focused critical attention upon the effect of pollution in the stream.

A number of the municipalities utilize surface water for public water supplies, and many of these communities have histories of inadequate supply. Municipalities obtaining their water supply from ground sources also have experienced serious shortages, in addition to problems associated with the treatment of highly mineralized water. This lack of surface water, together with water quality criteria necessary for municipal drinking water supplies and recreation use, has been recognized by the States by establishing stringent effluent standards for all organic wastes reaching the Red River of the North. However, even after these standards have been met, it still may not be possible to fully develop all of the beneficial water uses because of the limitations of treatment processes and the critical low stream flows which occur.

Present water uses include municipal and industrial water supply, recreation, irrigation, hydroelectric power, ice harvesting, and waste disposal; no new water uses are envisioned in the near future.

The basin has nine industrial surface water supplies with a total impoundment capacity of 524 acre-feet. There are 20 municipal surface water supplies which have a combined storage capacity of 6, 880 acre-feet, and 13 power dams having a total combined head of 309 feet have a total installed capacity of 13, 555 horsepower. There is a total impoundment capacity of 93, 653 acre-feet in 30 wildlife refuges in the basin.

Agriculture and its concomitant industries are the pillars upon which the basin's economy is founded. Field crops and livestock raising contribute largely to farm incomes. Food processing industries are predominant in the larger urban centers.

The water pollution control agencies of States in the Red River of the North watershed, in their efforts to spur pollution abatement and recognizing the interstate aspects of the problem, established an informal Red River Drainage Basin Interstate Sanitation Committee in 1944. Individually and through this cooperative interstate committee the States, municipalities, and industries have made commendable progress in relieving pollutional conditions. Nevertheless, in spite of this fine record of achievement, a problem of considerable magnitude still exists in the watershed.

The basin contains 90 municipalities with sewer systems which serve a total population of 189, 200. Industrial wastes contribute a population equivalent of 76, 000 to municipal sewer systems for a total untreated population equivalent of 265, 200. As a result

of programs of the water pollution control agencies of the States, treatment, which is provided by 75 percent of the sewered municipalities, reduces the strength of the municipal wastes slightly over 50 percent to a discharge with a population equivalent of 131,500.

Eighty-three industrial establishments, all associated with food processing, produce wastes, most of which are organic in nature, which are discharged directly to the watercourses. These wastes have a normal population equivalent of 125,000, which is reduced 40 percent by treatment to a population equivalent of 74,800. Two beet sugar refineries having a winter seasonal population equivalent of 220,000 discharge their wastes to lagoons. The discharge from these lagoons is controlled and correlated with high stream flows.

The most serious pollution is caused by municipal and industrial wastes in several localized areas in the main stem of the Red River of the North principally from Fargo to Grand Forks, although localized problems also exist at other points in the basin. Pollutional effects are increased by very low flows which occur frequently, and by long periods of ice coverage which greatly reduce or eliminate reaeration in the stream.

Among the most serious sources of municipal pollution on the main stem are East Grand Forks, Minn., where no treatment is provided, Grand Forks, N.D., where insufficient treatment is provided, and Fargo where treatment facilities are overloaded. Other smaller municipalities also discharge wastes which contribute significantly to the problem. The most serious sources of industrial pollution include the Potato Products Corporation at East Grand Forks, Minn.; The American Crystal Sugar Company at East Grand Forks, Minn.; and the Armour and Company plant at Grand Forks, N.D. Other industries while contributing less total pollutional material to the streams are also significant.

Discharge of untreated and insufficiently treated sewages and wastes to the watercourses of the basin have created health hazards, nuisances, and damaged all water uses. Tastes and odors have been produced in municipal water supplies, and high coliform bacteria counts in raw water supplies have often placed a critical load on the water purification facilities of these communities. Similarly high bacterial counts have made the use of natural ice hazardous, and have been a serious deterrent to the recreational use of certain of these waters.

Water quality for industrial purposes, irrigation, and stockwatering has been impaired in some areas. One of the important economic factors which must be taken into consideration is the possibility that new industry, which may be attracted to the area, might locate elsewhere because of the high costs involved in treating the polluted water so as to make it satisfactory for industrial purposes.

Aquatic and other wildlife propagation have also been harmed in places. Extremely low flows, together with long periods of ice coverage, accent these pollutional effects.

Wahpeton and Breckenridge have had a history of inadequate water supplies and other municipalities, using water from the Sheyenne and Red Rivers, have also experienced water quantity and quality difficulties during low flow periods, although in certain cases these difficulties have been alleviated through the provision of impoundment. In the main stem, oxygen is supplied almost entirely by aeration during open water periods because the turbidity in the stream restricts the growth of plants responsible for the production of oxygen by photosynthesis. During the extensive periods when the stream is frozen over the ability of the stream to obtain oxygen from the air is seriously retarded and the lack of oxygen in turn has a very detrimental effect on the aquatic organisms on which the natural pollution assimilation capacity is dependent. The dams above Fargo-Moorhead and below Greater Grand Forks aid in the aeration of the water to a limited extent. Stream surveys conducted in the summer of 1939 and the

winter of 1951, as reported in the Missouri-Souris report, confirm the findings of earlier surveys which established that pollution from the Fargo-Moorhead and Grand Forks-East Grand Forks area is sufficient to reduce the oxygen content of the Red River to levels inimical to aquatic life, to cause odors, and to devaluate its general usefulness.

Water quality objectives have generally been used by water pollution control agencies for many of the water uses.

The "Manual of Recommended Water Sanitation Practice," Public Health Service Bulletin No. 296, 1946, recommends certain specific criteria for municipal water supplies and is generally used as a guide by the three States and the waterworks profession. Because of the diversity of needs, quality requirements for industrial water supply vary widely, depending upon the needs of the industry under consideration. No general criteria have been adopted and each case must be considered separately.

Quality objectives for the bacteriological quality of bathing waters recommended by the Joint Committee on Bathing Places (Joint Study by American Public Health Association and Conference of State Sanitary Engineers), together with sanitary surveys, are widely employed in administration of pollution control programs as related to bathing waters.

A "Tentative Guide for Water Pollution Control Activities"--Missouri Drainage Basin, which was adopted on February 27, 1952 by the Engineering Section of the Missouri Basin Health Council, sets forth the objectives which are generally used in the determination of the suitability of waters used for irrigation. Since the three States in this area are also members of the Missouri Basin Health Council, the above-mentioned guide is also used in this basin.

Water quality objectives for fishing waters vary with the type of aquatic life to be protected. The general objectives advocated by the U. S. Fish and Wildlife Service calling for a balanced aquatic life habitat and limiting concentrations of pollutional substances are usually used by authorities in this basin.

The controlling water quality criteria for the main stem of the Red River of the North is the protection of the water supplies of the municipalities which are dependent on the stream as a source of water, while the controlling criteria for the remainder of the drainage basin varies with the use to which the waters are put. The critical low stream flows raise a serious problem in waste treatment works design, for works designed to give complete protection under such critical conditions in the Red River would be very costly and probably economically prohibitive. Treatment works, therefore, which are practical economically, will require dilution to meet these water quality standards. Plans to supply such dilution waters have been proposed by the Corps of Engineers and the Bureau of Reclamation and are discussed in reports mentioned in the introduction to this document. Funds have not been made available to date, however, to completely carry out either of these plans, although the Baldhill reservoir on the Sheyenne River and the Orwell reservoir on the Ottertail River have been completed and contribute flow to the river during low flow periods.

To further aid pollution control in the main stem of the Red River of the North, the Departments of Health in the States of North Dakota, South Dakota, and Minnesota; the North Dakota Water Conservation Commission; the Minnesota Department of Conservation; and the South Dakota agency concerned with water conservation formed an informal Red River Drainage Basin Interstate Sanitation Committee in 1944. In 1949, this committee adopted "Standards of treatment for municipal and industrial wastes for the Red River of the North", the formal text of which follows:

> "The following previously adopted standards on stream pollution control are hereby confirmed and clarified, and recommended for use under ordinary conditions as a basis for the review of plans prepared and submitted to the regulatory

agencies of the respective States for sewage and waste treatment facilities discharging into the Red River of the North and the tributaries as the affect the Red River of the North

"It is recommended that industry and municipalities treat their wastes to the point where the average daily composite 20°C., 5-day B.O.D. is 25 p.p.m., suspended solids 30 p.p.m., with no peaks running over 50 p.p.m. 20°C. 5-day B.O.D. and 60 p.p.m. suspended solids. Chlorination shall not be used as means of obtaining the B.O.D. reductions, although it may be required for other purposes. Certain types of industrial wastes, such as those resulting from the processing of agricultural products, may have to be considered on an entirely different basis.

"It is further recommended that these standards be considered as general only, and that they be subject to modification to meet specific pollutional problems as they develop."

The effluent standards were later adopted by the respective State regulatory agencies. The standards essentially establish the principle of secondary treatment for all organic wastes discharging to the Red River or to tributaries where they have an appreciable effect on the Red River.

WATER POLLUTION CONTROL PROGRAM

The States have been aware of the pollution problems in the Red River of the North watershed, as indicated by the many reports written on the subject, and have together established a comprehensive program designed to correct these conditions. The comprehensive water pollution control program is now in effect and is described herein. Much has already been accomplished toward the completion of this program, as evidenced by the fact that 75 percent of the sewered municipalities and 65 percent of the industrial establishments provide treatment for their wastes. However, the program calls for the construction of a number of new municipal and industrial waste treatment works, and enlargements and additions to existing treatment plants which are required before the program is completed. It recognizes the need for improved operation of some existing waste treatment works.

The program is firmly based upon the findings of a number of stream studies, surveys, and investigations as reported in the introduction. The corrective measures were determined only after a thorough consideration of all existing beneficial water uses in the basin, as well as those which might materialize in the immediate foreseeable future, and are intended to restore, preserve, and protect the water quality necessary for these uses.

The program is flexible, not static, and is intended to reflect the needs for the present situation as currently determined, but changes in stream characteristics, pollutional load, or water uses all may require revision from time to time as conditions change.

The essential elements of the program as developed by the States concerned consist of the following:

1. Provide the following improvements at the earliest possible date (See footnote [a]):

Name and location	Population equivalent discharged	Treatment		
		Existing	Needs (or equivalent industrial waste control measures)	Project (a)
Minnesota				
Argyle	1,050	None	Secondary	New plant
Blackduck	1,020	Primary	----do	Replacement
Breckenridge	3,100	None	----do	New plant
Calloway	280	Primary	----do	Addition
Climax	100	None	----do	New plant
Crookston	7,500	----do	----do	Do.
Donnelly	780	----do	----do	Do.
East Grand Forks	6,280	----do	----do	Do.
Potato Products Corp.	26,300(b)	----do	----do	Do.
American Crystal Sugar Co.	94,000(b)	Minor	----do	Do.
Elbow Lake	1,380	Primary	----do	Addition
Frazee	2,520	----do	----do	Do.
Frazee Cream Co.	610	None	----do	New plant
Fergus Falls	20,730	Primary	----do	Addition
Fertile	2,900	None	----do	New plant
Graceville	790	Primary	----do	Addition
Hallock	1,790	----do	----do	Do.
Halstad	720	None	----do	New plant
Hawley	2,980	----do	----do	Do.

(See footnotes at end of table)

Name and location	Population equivalent discharged	Treatment		
		Existing	Needs (or equivalent industrial waste control measures)	Project (a)
Minnesota--Continued				
Herman	780	None	Secondary	New plant
Kelliher	170	Primary	----do	Addition
Kennedy	290	None	----do	New plant
Lancaster	270	Primary	----do	Do.
Mahomen	1,620	None	----do	Do.
Northhome	140	Primary	----do	Replacement
Omega:				
Omega Creamery	670	None	----do	New plant
Pelican Rapids:				
Farmers Co-op. Creamery Assn.	1,030	----do	----do	Do.
Red Lake Falls	1,790	Primary	----do	Enlargement
Stephen	1,080	----do	----do	Addition
Sunnyrest Sanatorium	80	None	----do	New plant
Twin Valley	830	----do	----do	Do.
Warren	1,590	Primary	----do	Replacement
Wolverton	360	----do	----do	Addition
North Dakota				
Anamoose	900	None	Secondary	New plant
Casselton	1,800	Septic tank	----do	Do.
Cavalier	1,200	----do	----do	Replacement
Cooperstown	1,060	Septic tank	Secondary	New plant
Drayton	950	None	----do	Do.
Drayton Creamery	640	Septic tank	----do	Do.
Enderlin	1,400	----do	----do	Do.
Fairmount	2,080	None	----do	Do.
Fargo	43,700	Secondary	Additional treatment	Enlargement
Finley	940	Primary	Secondary	Addition
Forman	400	Septic tank	----do	New plant
Grand Forks	29,850	Primary	----do	Addition
N.D. Mill & Elevator	2,500	None	----do	New plant
Rogers Bros. Seed Co., Food Products Div.	6,700	Primary	----do	Addition
Armour & Co.	32,100	Minor	----do	New plant
Meat Service Co.	600	Septic tank	----do	Do.
Hankinson	1,660	----do	----do	Do.
Harvey	2,500	None	----do	Do.
Hillsboro	2,640	----do	----do	Do.
Lidgerwood	1,100	Septic tank	----do	Do.
McVille	800	----do	----do	Do.
Mayville	2,000	Primary	----do	Do.
Northwood	810	----do	----do	Addition
Park River	1,600	----do	----do	Replacement
Walhalla	1,000	None	----do	New plant

(See footnotes at end of table)

Name and location	Population equivalent discharged	Treatment		
		Existing	Needs (or equivalent industrial waste control measures)	Project (a)
North Dakota--Continued				
Wimbledon.....	600	Septic tank	Secondary	New plant
South Dakota				
Veblen.....	540	Primary	Secondary	Addition

(a) Fifty-seven sources of pollution such as smaller creameries and municipalities without public sewer systems have not been included but may require attention because of local significance.

(b) Seasonal industries.

2. Operation of all existing and future municipal and industrial waste treatment works be brought to a uniformly efficient and high level in order to obtain the maximum benefits from these structures and permit their most effective utilization.

3. New or increased sources of pollution be controlled by receiving adequate treatment before being permitted to be discharged.

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